

Variation in Ferns.

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In connection with the article in this number on ferns for the house, attention may be called to the different types of variation indicated by the plants illustrated. Briefly, these may be summarized as follows:

1. *Dwarfing*: The Mills Boston fern is a very good illustration, being less than a third the size of the normal Boston fern; also the dwarf holly fern, *Cyrtomum falcatum* *Rochfordianum compactum*.

2. *Ruffling*: Several of the varieties illustrated show ruffling. Manda's polypodium, the Siebold pteris, the holly fern, and the Riverton pteris all show considerable ruffling of the pinnae, together with the irregular lobing of the margins which always seems to accompany this character. An additional point is the fact that ruffled ferns are usually less fertile than the plane-leaved types.

3. *Variegation*: The presence of a white stripe down the middle of the pinnae is shown in several of the pteris varieties illustrated: *P. cretica albolineata*, *P. cretica Alexandrae*, *P. ensiformis Victoriae*, *P. cretica Mayi*, *P. quadriaurita argyrea*. It occurs also in a *Polystichum*, *P. aristatum*, which is a common trade fern.

4. *Cresting*: This is one of the commonest types of variation in wild as well as in cultivated ferns. As it appears in cultivated varieties, it seems to be a permanent characteristic, repeated in the spore progeny. Among wild plants it sometimes seems that cresting merely affects a single leaf or two occasionally.

5. *Division*: The best illustration of variation in division, among the plants figured, is shown by the Verona variety of Boston fern. This is a common occurrence, however, both among cultivated ferns and to a less extent among the wild forms. A distinct twice-

divided Christmas fern form has been found more than once. (Fern Bull. July 1907, and October 1909).

6. *Sterility*: Reference has already been made to the fact that ruffled varieties are generally less fertile than the normal types. Apparently, also, sterility may sometimes appear to be the only distinction between the normal form and the new type. The Boston fern, as compared with the wild sword fern, its ancestor, differs mainly in the fact that it produces no fertile spores. To be certain of sterility, it is necessary to make a careful examination under the microscope of the contents of often apparently fertile sori.

7. *Spiral Twisting*: A single form of Boston fern with leaves curiously twisted in irregular spiral fashion is under cultivation. As many as seven complete rotations have been noted in a single leaf. In another *Nephrolepis* form, the twisting takes a form which causes the pinnae to stand out at all points of the compass instead of being arranged in two rows extending in opposite directions.

8. *Determinate Growth*: Among Boston ferns and, in fact, in the genus *Nephrolepis* in general, it is a rare thing to find the tip of the leaf completely unrolled. Dr. Small reports the wild species of Florida reaching lengths of over twenty feet primarily due to indeterminate growth. Two or three varieties of Boston fern, however, have shown the ability to complete the leaf tip.

9. *Vivipary*: A recent horticultural form of Boston fern has added the ability of the leaves to produce new bud plants to the other characteristics of the genus. So far as I know no other form or species of *Nephrolepis* is able to bear buds on the leaf.

10. *Apospory*: Investigators of some of the cultivated forms of unusual sports of *Dryopteris* have reported that occasionally new prothallia may be produced directly from the margin of a normal leaf, that is, leaving out the necessity of development of prothallia from spores.

It has always seemed to me possible that some of our native species of *Dryopteris* may be found to do the same thing, especially some of the hybrid types which have no fertile spores, but which form large clumps in a favorable location.

It would be extremely worth while for members of the Fern Society to bear in mind the possibilities of variation which have been detected already partly among wild forms, but especially in cultivated types as indicated above. For example, there is every reason to expect that eventually a variegated form of some of the common wild species will turn up. In general, variegation represents a loss of vigor for the plant, so that such a plant would then need to be transplanted to a garden where it could receive careful attention.

Mr. Weatherby has written outlining five types of Christmas ferns which he has seen. Classified according to the list of variations, they represent namely: 1.—The normal form. 2.—A crested form. 3.—The ruffled type. 4.—A twice-pinnate type. 5.—Another division form not distinctly twice-pinnate. I should be very glad to receive plants of any distinct forms of Christmas ferns which members may find or if whole plants are not available, to receive fertile leaves which show the variation. In view of the fact that the cultivated variety of the sword fern, specifically the Boston fern, has been found to give rise to so many and unusual new varieties, it will be interesting to make a thorough study of the dagger fern (*Polystichum acrostichoides*) with its similar leaf cutting, to see whether it may not also be in the process of variation and potential evolution of new forms. Of Mr. Weatherby's list of five forms, I have found four: a most distinctly ruffled type, a completely twice pinnate type, and the twice pinnatifid form, together with the normal. Is not the common sensitive fern an illustration of ruffling fixed in a wild species?

Mr. Waters writes in a recent letter: "In collecting for my herbarium, I always got as many different forms of a species as possible. Forking fronds interested me, but not as much as normal ones showing intangible and indescribable variations in leaf cutting." In this connection, it may be added that in the Boston fern series of varieties occur forms distinguished by reflexed pinnae, by blunt tips, by different colored stipes and rachides, by different shaped bases of the pinnae, by the brittleness of the leaf stalks, et al. Such differences remain constantly distinguishable throughout years of cultivation and vegetative reproduction of the varieties concerned.

BROOKLYN BOTANIC GARDEN.

A LIST OF FERNS FOUND IN WOODSTOCK, CONN.—The three *Osmundas*; *Botrychium virginianum*, *B. obliquum* (common locally, with a fair sprinkling of forma *dissectum*), *B. matricariaefolium* (one station) and *B. simplex* (one station); *Ophioglossum vulgatum* (one station, recently discovered); *Pteris aquilina*; *Woodsia obtusa*; *Polystichum acrostichoides*; *Dryopteris Thelypteris*, *D. noveboracensis*, *D. simulata*, *D. marginalis*, *D. cristata*, and *D. spinulosa* and its variety *intermedia*; *Asplenium platyneuron* and *A. Trichomanes*; *Athyrium acrostichoides* and *A. Filix-femina*; *Polypodium vulgare*; *Phegopteris polypodioides* and *P. hexagonoptera*; *Cystopteris fragilis*; *Dennstaedtia punctilobula*; *Adiantum pedatum*; *Onoclea sensibilis* and *O. Struthiopteris* (one station).

Woodsia ilvensis is found a short distance outside of Woodstock's borders. *Onoclea Struthiopteris* seems to be extremely rare here, but is found outside the town limits.

The first *Botrychium obliquum* I was privileged to find was a *dissectum* form and was growing by our front